concrete construction

DECEMBER 1958 VOL. 3, NO. 12

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DEPARTMENTS

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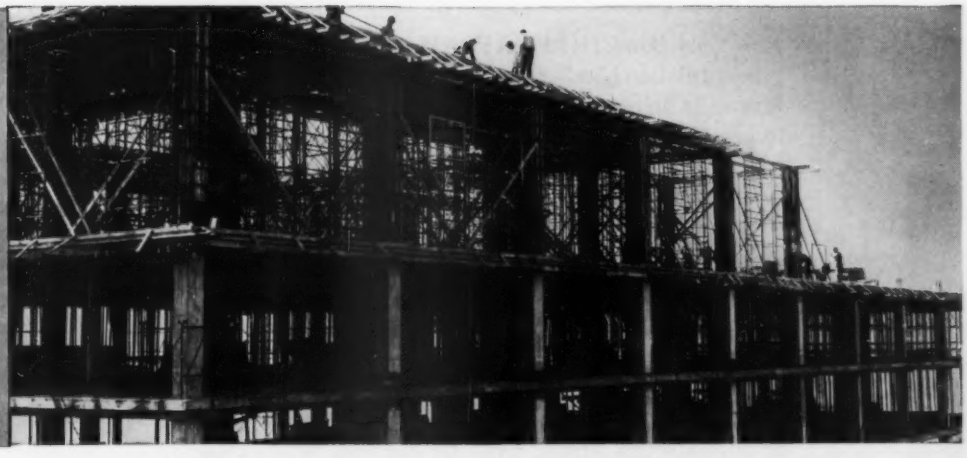

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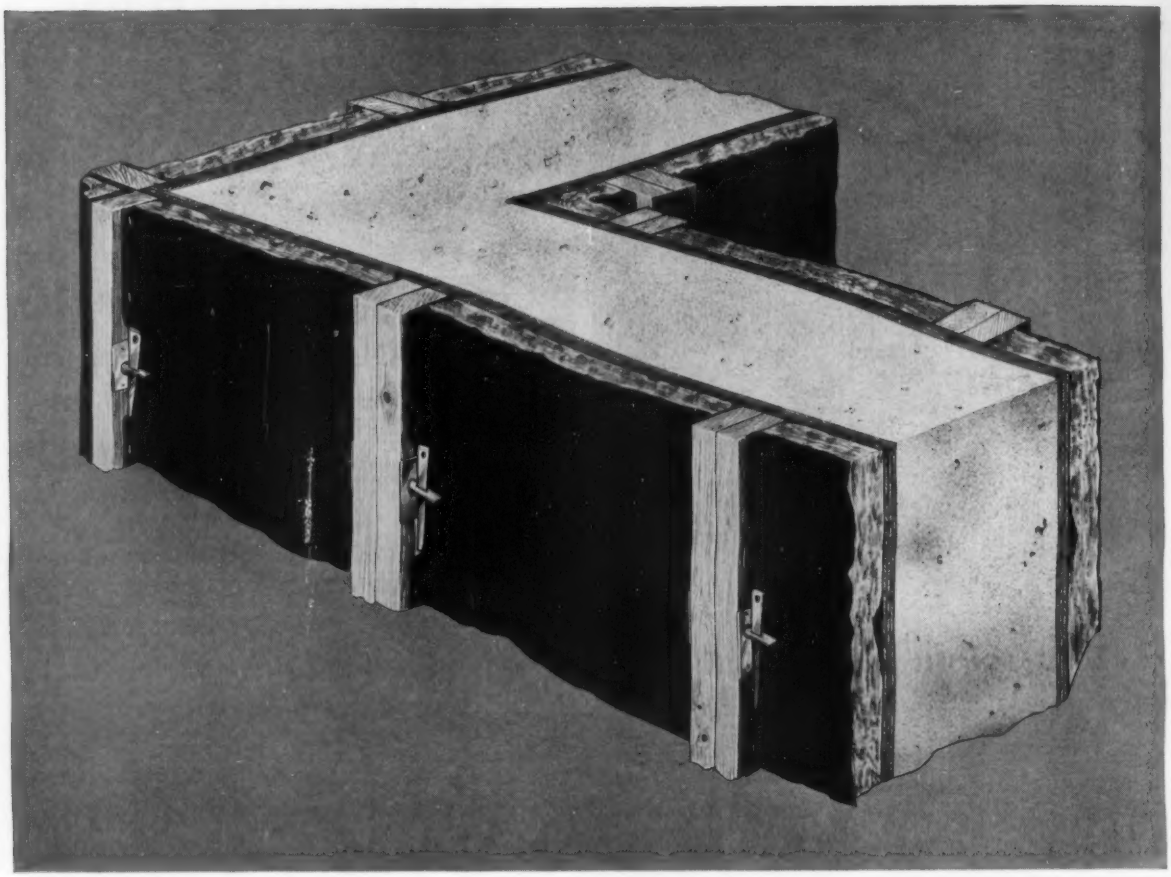

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A concrete wall after the demolition charge had done its work. The concrete was not reinforced. In reinforced concrete it is usually necessary to use linear-shaped charges in order to break the steel.

The very qualities which make concrete the outstanding construction material it is present some serious problems in connection with its demolition. Here, for that next project which poses this vexing problem, are . . .

Some New Data on DEMOLITION

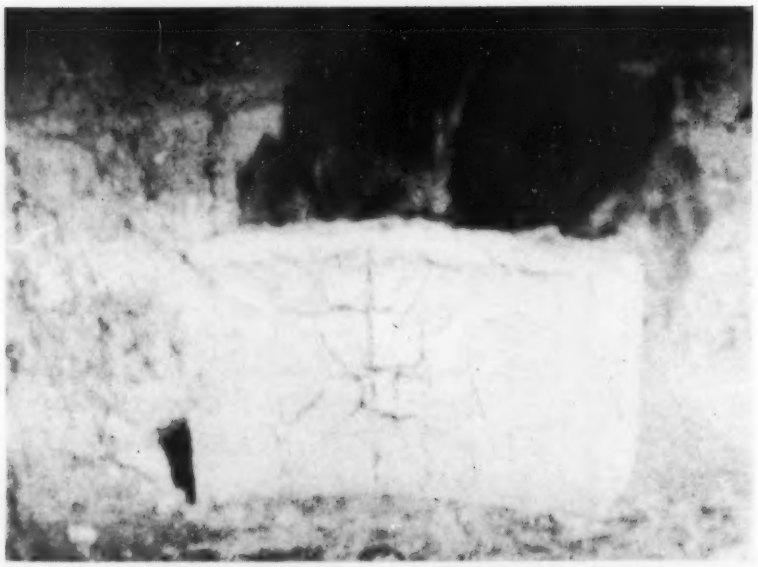
WRECKING AN OUTMODED, inadequate bridge or blowing up a reinforced concrete warehouse to carve a path for a new freeway is quite similar to wartime demolition of a bridge vital to enemy supply lines or the blasting of a weapons supply center.

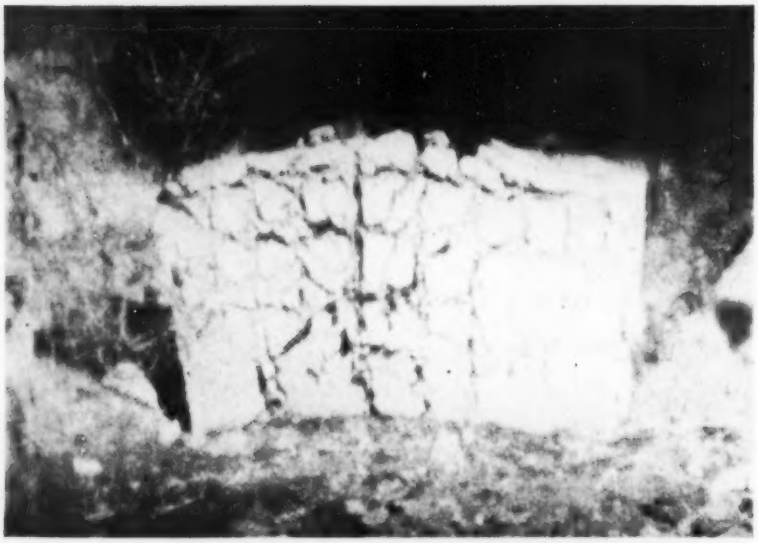
Consequently, recent studies at Stanford Research Institute, Menlo Park, California, primarily directed toward learning more about high-explosives phenomena to aid military operations, have resulted in information with considerable potential value for civilian wrecking operations related to problems of highway realignment and urban rebuilding and redevelopment.

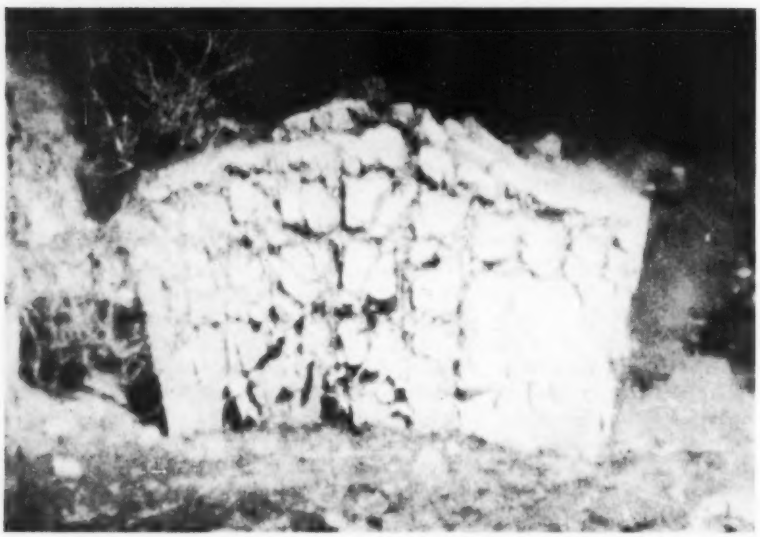
The investigation, sponsored by the U. S. Army Engineer Research and Development Laboratories and headed by S. A. Moses, senior explosives engineer, was part of a major Institute effort in the field of explosives phenomena. It has led to new formulas and techniques for blasting concrete, cutting steel and breaking up wood. Much of the information was obtained through the use of ultra-high-speed cameras which provided a visual record of the highly complex and rapid sequence of events that occur during an explosion.

Demolishing Concrete

Blasting concrete for military or civilian purposes usually involves the breaching of walls, the breaking up of foundation piers or beams, or the complete destruction of obstacles. An explosive "pancake" provides the best results for breaching walls. Thus a 20-pound TNT charge, 16 inches square and 1¾ inches thick, will demolish a wall 3 feet thick, 5 feet high, and 9 feet long. Longer walls require addi-







This remarkable series of photographs shows what happens to a block of reinforced concrete from the instant the demolition charge is detonated. Note how the block cracks in a square pattern following the steel rod reinforcement which tends to hold the concrete together.

tional charges of similar weight and shape.

Tests on breaching concrete employing various sizes, shapes, and positioning of explosive charges, have resulted in the following fundamental information on what happens during such explosions. Although the events appear simultaneous in action, they actually take place in an orderly sequence.

An initial pressure pulse from detonation of an explosive charge placed against a concrete wall creates a crater directly under the charge. Simultaneously, a shock transmitted through the concrete, and then reflected as a tension pulse, causes a concrete spall to break away from the opposite side of the wall. When the charge is powerful enough, the crater and the cavity created by the spall's removal meet to form a break in the wall. High pressures created by the explosive also result in a bulging or bending action that causes cracks to radiate from the charge position toward the outer wall boundaries.

Cutting Steel

Data obtained from the study indicate that greater explosive effectiveness is possible with explosive blocks rectangular in form as compared with the present Army standard square block. For example, a charge 1 by 2 by 12 inches will cut a 12-inch square steel plate as efficiently as a standard block 2 by 2 by 11 inches in size. Less explosive is thus required to cut structural steel plate, girders, pipes, and rods. The suggested dimensions also

simplify the calculation of charge weights by putting it on a pounds-per-foot basis.

The degree of contact between the explosive charge and the steel is also important. Standard TNT charges, when unwrapped and placed in direct contact with the metal, can cut thicker steel than when enclosed in the regulation cardboard container. By repackaging present TNT explosive blocks to eliminate a 3/32-inch air gap between the charge and the metal to be cut, effectiveness is increased by one-third.

Special charges should be developed for cutting wire cables, pipes, and steel bars. The block-type charge compresses or "squeezes" metal in such form to a narrower dimension but does not always result in a complete cutting action.

When a rectangular block of explosive is placed on a steel plate and detonated at one end, the detonation moving along the charge changes it almost instantaneously from a solid into a compressed gas under extreme pressure. This action sends an initial pressure pulse or disturbance throughout the plate. Various reflected tension impulses are created, causing the following action sequence: A slab of metal, or spall, is first thrown off the opposite side of the plate, and the steel immediately beneath the charge is dented. A lengthwise split as long as the charge cuts the plate while a cross-fracture splits the plate at right angles at the end of the charge away from the detonation point.

Broadening Shock Effect

Explosive effectiveness is increased considerably by tamping the charge (covering it with wet earth, sand or sandbags), or burying it in the ground against the concrete, as in blowing up a bridge abutment. The tamping material transmits the shock over a wider area of the wall to be breached. It also slows down the expansion of the hot detonation gases, holding them against the concrete for a longer period of time. The shock transmission role of the tamping material is probably more important than the effect of its mass as shown by the greater effectiveness of wet materials. A tamped, 15-pound, TNT charge can demolish a 3-foot thick reinforced concrete wall; a similar charge, untamped, leaves the wall relatively intact.

In reinforced concrete, an intense explosive shock creates vibrations in the reinforcing steel bars, causing extensive fragmentation along the concrete surface outside the reinforcement. Elsewhere in the concrete, where the shock is weaker, the reinforcement tends to hold the concrete together. In most instances, reinforcement bars are not broken by the explosive. Cutting tools or linear-shaped charges are necessary in order to effect such break-up.

The amount of TNT required to destroy a concrete wall, pier, or beam can be readily determined by revised formulas resulting from the experimental studies. These formulas include such factors as wall thickness, the kind of concrete to be breached, and the effect of tamping.

Complete destruction of concrete obstacles requires pulverization of the concrete and a different formula than that used for walls and piers. Placement of the charge is an important factor.

Breaking Wood

Demolition of trees and wooden trestles, bridges, and other structures is important to military ground operations or to civilian wrecking or ground-clearing activities.

The present formula for wood, representing a relationship between the weight required and the distance from the explosive position to the far side of tree or timber, appears quite satisfactory. However, the present standard practice of placing a bulk charge on one side of a tree or timber is not as efficient as putting smaller charges on two opposing sides. The two charges —together equal in weight to a single charge—will completely sever a log or timber; the single charge will only cut deeply into the wood. In addition, placement of the two charges in staggered fashion permits directional control of the fall of a tree or timber.

Detonation of an explosive charge in contact with a tree or timber first produces extremely high pressure and particle speed in a localized area under the charge. This action breaks the wood fibers to a limited depth much as if the wood had been struck by a heavy steel bar swung with extreme force. The partially cut wood is then bent by the explosive gas pressure and related air shocks. The tree or timber is broken either by the original bending action or by snapping back after the gas pressure has dissipated. END

Parts I and II of this article dealt with types of treatment, appearance of finishes, maintenance requirements, conditions of exposure, materials and the types of backgrounds on which rendering is applied.

This final installment takes up mix proportions and the specific techniques called for to produce various types of finishes.

EXTERNAL RENDERED FINISHES

(Part three of three installments)

MIX PROPORTIONS

Suitable proportions of total cementing agent (cement and lime) in mixes for rendered finishes are governed partly by the requirement that the amount of such material shall be just sufficient to fill the voids between the coarser sand particles, and partly by the working properties necessary. With normal sands the amount of this fine material required to give the maximum density is about 30 to 40 percent of the amount of sand. A mix should normally, therefore, contain 1 part cement and/or lime to 2½ to 3 parts of sand or other aggregate. If it is made richer than this the shrinkage of the material on drying becomes larger and the risk of cracking much greater; if it is made leaner the mix becomes harsh and difficulty to apply. With some crushed stone sands, in particular some limestone sands, a leaner mix may have satisfactory workability, since some of the stone dust is of similar fineness to the cement or lime. Some loamy natural sands could also be handled in lean mixes, but they are unsatisfactory in other respects and should not be used for renderings.

The function of the cement in a rendering mix is to provide strength and durability. For most work the strength of a 1 : 3 mix of cement and sand is far greater than necessary, and the use of such a mix, particularly on rigid backing materials of lower strength, is likely to give rise to cracking. Such a strong mix cannot yield locally to the stresses set up by drying shrinkage, and these stresses tend to build up until relieved by a crack at some weak point. If the backing material is not strong, the rendering may pull away some of the surface of the material when cracking occurs; or if the adhesion is poor, the rendering will come away from the backing. Once this has happened rainwater may penetrate through the cracks, and together with frost or action by sulfates in the walling material may cause further loss of adhesion and finally complete breakdown of the rendering. The risk of this type of failure arising with these rich, strong and dense mixes is increased by their low permeability, which prevents the drying out of moisture that has got behind the rendering through cracks or defects resulting from faulty detail in the design. The use of a 1 : 3 mix of portland cement and sand should, therefore, be restricted to conditions where the background is strong and good adhesion can be obtained, and where a very dense and impermeable finish is essential (e. g., for plinths or in positions exposed to water). In pebble-dash also, where plasticity for holding the pebbles when first thrown and strength for retaining them subsequently are necessary, a 1 : 3 mix is suitable.

For all other work mixes of lower cement content should be used; satisfactory working qualities can be retained most readily by using lime, which contributes practically no strength at early ages, in place of a portion of the cement. The lime not only improves workability but also helps the rendering to retain water against the suction of the background. Mixes of one of the following two types are suitable for most purposes: (a) portland cement : lime : sand in the proportions 1 : 1 : 5-6 by volume; (b) portland cement : lime : sand in the proportions 1 : 2 : 8-9 by volume. Even lower cement contents are sometimes used, but the 1 : 2 : 8-9 type has been found most suitable for the less exposed and the 1 : 1 : 5-6 type for the more exposed conditions. Further details of appropriate conditions for the use of either type of mix are given later.

Hydraulic limes, and so-called "Roman cements" which are closely similar

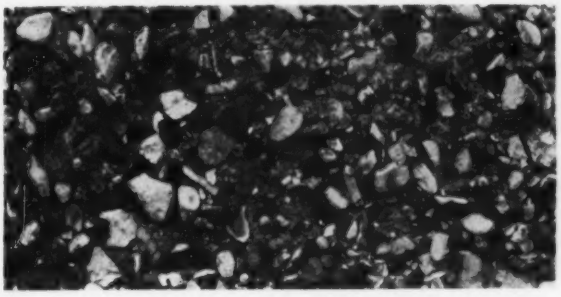
to hydraulic limes, should be used in the proportion of one part of lime to two to three parts of sand. They are less reliable in strength and durability than the portland cement-lime-sand mixes, and their use is now confined mainly to repair of old painted stucco work.

High alumina cement may be used in a 1 : 3 mix with sand, or where a lower strength is required in a mix of one part high alumina cement, one part ground chalk or limestone and six parts sand. It is necessary to use ground chalk instead of lime, since lime completely upsets the setting and strength development of this type of cement. Such mixes may be useful where a rendering has to be applied on brickwork containing sulfates under conditions where the brickwork may remain damp and also for work which has to be painted soon after application.

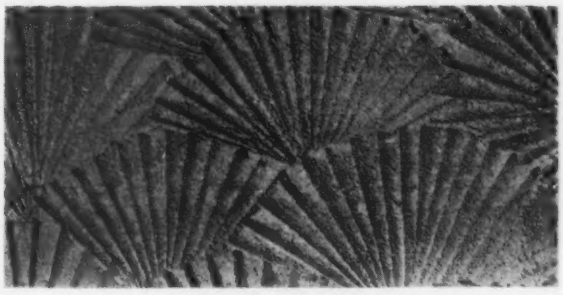
Spatter-dash initial coatings are applied to some types of backing material and are thrown on to the wall in a layer ⅛ to ¼ inch thick before applying the normal undercoat. They should consist of one part cement to two or

Pictorial Summary of External Rendered Finishes

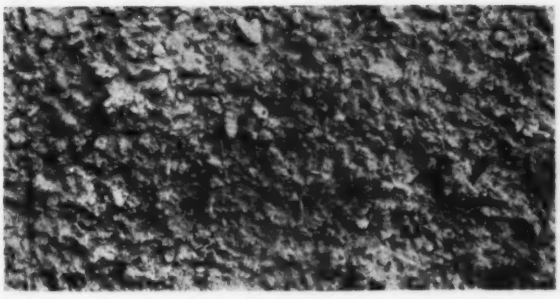
Pebble-dash



Fan Texture

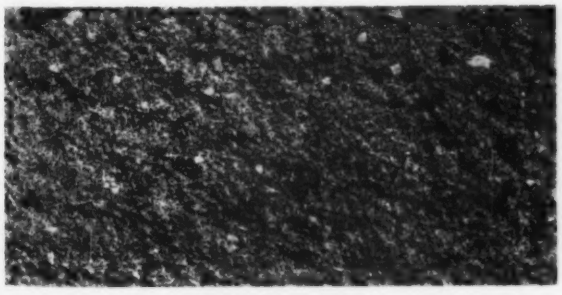


Roughcast or Wet-dash

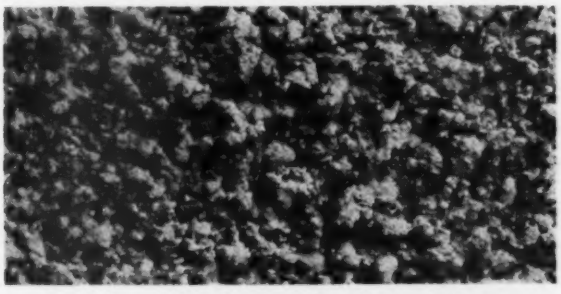


English Cottage Texture

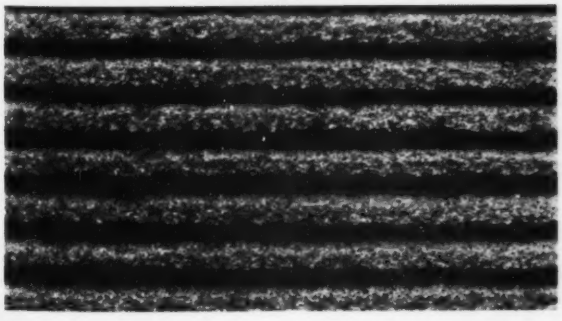
Scraped Finish



Course Texture (machine-applied)



Ribbed Texture



Medium Fine Texture (machine-applied)

three parts of coarse sand. The use of a spatter-dash coating may be an advantage on dense concrete surfaces to give an improved bond for the rendering, on materials of high or uneven suction, and on some types of old work to which adhesion may be difficult.

Mixes for roughcast finishes usually consist of cement, sand and fine gravel or crushed stone, in the proportion of one part of cement to three of the aggregate. The maximum size of the fine gravel or crushed stone may vary from ¼ to ½ inch, according to the texture required. The workability is improved by replacing up to half of the volume of cement by lime, and this should always be done if the undercoat is a cement : lime : sand mix.

For a pebble-dash finish, as indicated above, both plasticity of the mix and strength when hardened are necessary. A mix of one part of cement to three parts of sand may be used, or one part of cement, one part of lime, and five parts of sand. The undercoat should have the same composition as the finish.

Suitable mixes for a variety of finishes and conditions are given in Table 3. The preparation of materials for rendering is generally the same as that for mortar. The water content of rendering mixes is usually lower, and the consistency stiffer, than that of mortars for brickwork, and a closer judgment of consistency and more care in attaining it is required by the plasterer.

APPLYING RENDERINGS

The application of renderings is a skilled craft usually carried out by plasterers or masons. It is not within the scope of this article to attempt to describe the craft processes, but it may be useful to indicate the alternative methods of application and some of the more important items of craftsmanship. The quality of craftsmanship is, without question, a major factor affecting both appearance and durability, and poor work can defeat the utmost care in specification and design.

Scaffolding. Where possible independent, free-standing scaffolding should be used for applying external finishes, in order to avoid the difficulty of making repairs after the scaffolding is removed.

Preparing the background. It is sometimes necessary to prepare the background before applying a rendering. With brickwork, raking of the mortar joints is in all cases desirable and is essential where the bricks are of a dense and impermeable type, such as some engineering bricks, unless a spatter-dash coating is to be applied. The joints of new brickwork may be raked as the bricks are laid, which will involve little extra work. With old work, particularly if the mortar is hard, raking the joints may involve considerable time and labor; in such circumstances, therefore, it can well be restricted to the essential cases described above. Concrete surfaces, when there is any doubt as to whether the rendering will adhere to the background, should be close hacked in order to provide an additional mechanical key. An example is concrete which has been placed against oiled formwork.

Old work, whether of brick, block, or poured concrete, should be thoroughly wire brushed and washed down, preferably with a hose, before any rendering is applied. If there is any possibility that oil paint, distemper, bituminous coatings, or colorless waterproofing materials have been applied at any time on the surface, it is advisable to render a substantial trial area and to leave it for a few months to see whether the rendering still adheres. (TURN TO PAGE 12)

TABLE 3
Mixes for External Renderings

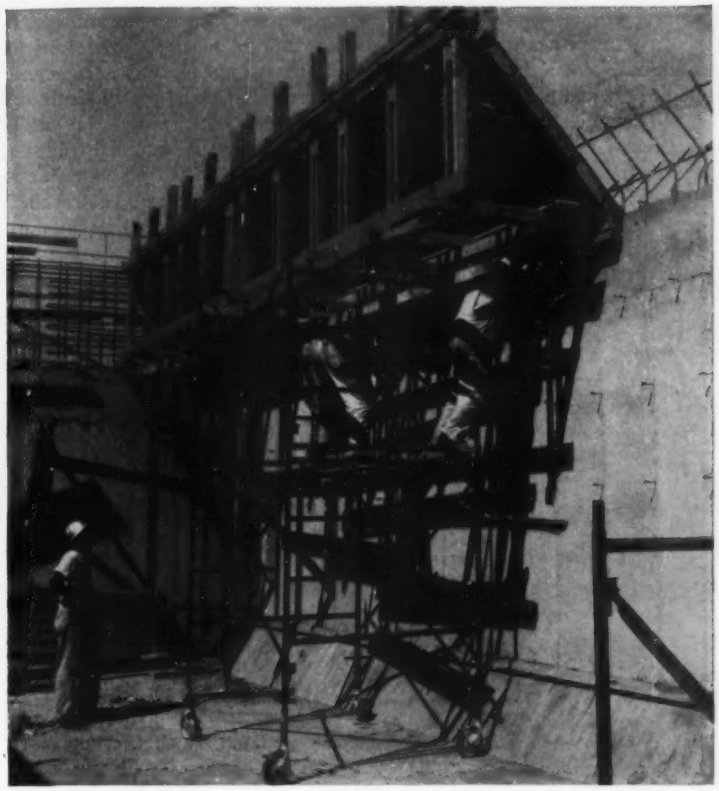
Recommended composition of mix, as proportion of cement-lime-sand (parts by volume) for the following conditions : —**

TREATMENT	ON STRONG OR MODERATELY STRONG BACKING MATERIALS			ON WEAK OR MODERATELY WEAK MATERIALS	ON WOOD-WOOL BUILDING SLABS
	SEVERE EXPOSURE	MODERATE EXPOSURE	PROTECTED		
Spatter-dash	1:0:2 to 1:0:2½	1:0:2 to 1:0:3	1:0:2 to 1:0:3	None	None
Pebble-dash (undercoat and finish coat)	1:0:3	1:0:3 to 1:1:5	1:1:5	not recommended	1:0:3 to 1:1:5
Roughcast undercoat finish coat	1:0:3 1:0:3*	1:0:3 to 1:1:6 1:0:3* to 1:1:6*	1:0:3 to 1:1:6 1:0:3* to 1:1:6*	1:1:6 1:1:6*	1:1:6 1:1:6*
Scraped and textured (undercoat and finish coat)	1:1:6	1:1:6 to 1:2:9	1:2:9	1:1:6 to 1:2:9	1:0:3 to 1:1:6
Smooth floated (undercoat and finish coat)	1:1:6	1:1:6 to 1:2:9	1:2:9	1:1:6 to 1:2:9	not recommended
Machine applied undercoat finish coat	1:1:6	1:1:6 to 1:2:9	1:2:9 as for undercoat or proprietary mixes	1:1:6 to 1:2:9	1:1:6

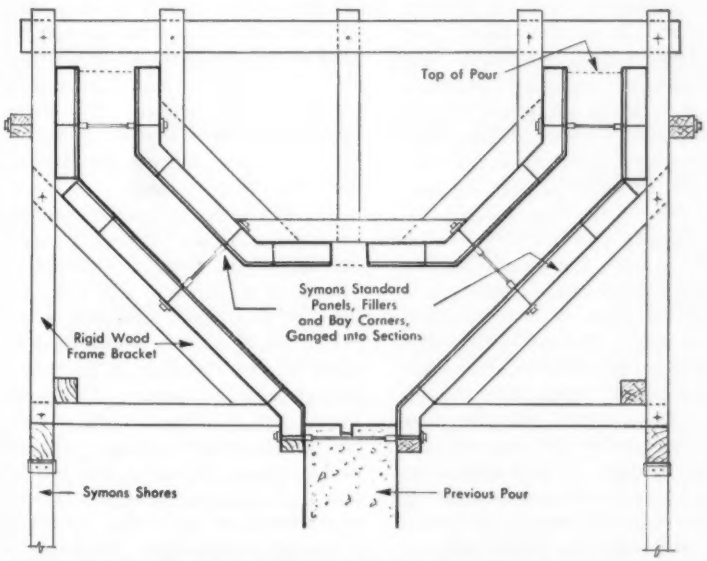
**The proportion of sand given is for a well graded material.
With very coarse or uniformly fine sands use 8 instead of 9, and 5 instead of 6 parts.

*This refers to parts of sand plus gravel or crushed stone; the ratio of sand to stone or gravel should be between 1:1 and 2:1 according to the texture required.

Gang Forming Licks "Y" Wall Problem



Workmen on Columbus sewage extension job are putting a gang forming section into place for a pour with aid of rolling scaffolding. Ganged section was 16 feet long.



Typical "Y" wall section in which Symons standard panels, fillers, inside and outside bay corners, which were eight feet long, were ganged in 16 foot sections.

Pays Off in Quality Pours, Speed and Reduced Costs

2,665 lineal feet of "Y" walls and half "Y" walls, with 16'9" high walls on a tank addition to a sewage treatment plant—that was the pouring problem faced by contractors, Wander & Mason of Worthington, Ohio.

They solved the problem by pouring the walls in three lifts with the forms ganged for the final "Y" and half "Y" pours. The tank was 485 feet long and 120 feet wide with five 485 foot "Y" walls in the tank.

On the "Y" walls Symons standard panels, fillers, inside and outside bay corners, which were eight feet long, were ganged in 16 foot sections and handled either by crane or rolling scaffolding. Ganging the forms licked the problem. Quality of the pour was excellent. Speed of erecting and stripping reduced cost appreciably. One 16-foot outside section was stripped, moved to the next wall section and reset by three men in 20 minutes.

Rigid frames to brace the ganged forms were designed by Symons engineers and representative Rapid Construction Equipment, Inc., and built on the job site by the contractor. The outside "Y" wall form section was held to the previous pour by anchor bolts and supported by Symons Shores spaced four feet on center at the outer extremities of the bracket. Additional shores were used beneath the bracket to supplement the anchor bolts near the main wall.

Inside forms were completely ganged and before pouring were bolted to the outer vertical members of the outside frame. This method held the inside forms in position along with the assistance of the coil ties which were spaced on four foot centers. This prevented the inside from floating while pouring.

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If such treatments are known to have been applied, it will probably be necessary either to hack the surface thoroughly or to apply light expanded metal to act as reinforcement to the rendering. The expanded metal should be of ¼- or ⅜-inch mesh and should have been given a bituminous treatment to reduce risk of corrosion; it should be fixed with rustproof staples after plugging the wall at intervals not greater than 18 inches in any direction with wood plugs which have been treated to prevent dry rot. The first coat of rendering should be a 1 : 1 : 6 cement : lime : sand mix and should be of sufficient thickness just to cover the expanded metal. A second rendering coat should be given before applying the finishing coat.

The necessity for wetting down a surface before applying a rendering and the extent to which it should be wetted can be judged only by the craftsman. The nature of the surface, the type of mix being used, the method of application, the aspect and the weather should all influence his decision.

Undercoats. Spatter-dash treatments are applied by throwing, either from a trowel or scoop, or from a bunch of twigs. The mix should be made to a wet consistency, almost a slurry, but varied according to the suction of the backing material. The wall surface should be just covered with a thin layer, and no attempt should be made to level or smooth the coating in any way.

Undercoats, other than spatter-dash, may be applied either by throwing from the trowel or by laying on with the trowel. It is sometimes claimed that there are advantages in the thrown coating, but there is little evidence available to show whether this is so, except with spatter-dash or roughcast where throwing is the only satisfactory method.

Undercoats serve several purposes. They provide a means of straightening or leveling an uneven surface, and are, therefore, sometimes known as straightening coats. They seal the surface of the wall and are often the most important part of the treatment as far as keeping out rain is concerned. They provide a surface of even suction and good adhesion for the finishing coats, and prevent "grinning" of joints or of areas of differing suction which show unpleasantly with any type of single coat treatment. The thickness may vary to some extent owing to unevenness of the wall; it should not exceed ⅝ inch or be less than ⅜ inch in any part and, if the wall is so uneven as to require greater thicknesses to build up to a level surface, two undercoats should be used each not greater than ⅝ inch thick. When the undercoat has started to dry and harden it should be combed or scratched at close intervals to a depth of ⅛ to ¼ inch, except when a machine-applied finishing treatment is to be used; these finishes are applied to the level screeded surface. The composition of undercoats should always be such that they are not weaker than the coats applied over them.

The undercoats should each be allowed to dry as long as possible before a further coat is applied in order to allow the initial shrinkage and any cracking to take place without affecting the finish. It is desirable to wait at least two days in dry summer weather and a week or more in cold and wet weather. If the undercoat has then dried very thoroughly it may be necessary to damp down again using a brush or spray before applying the finish, but this requirement should not be regarded as contradictory to the need for the initial drying.

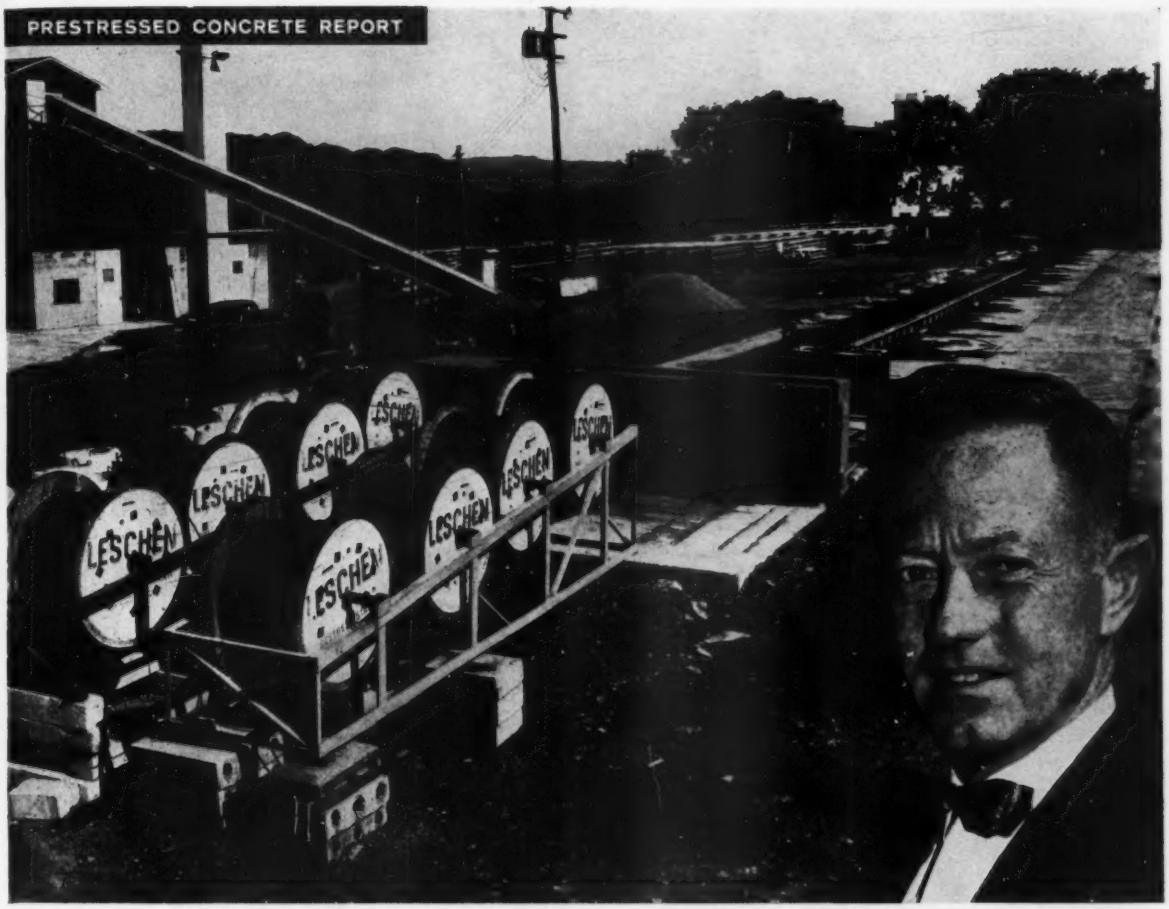
Finishing treatments. Final coats or finishing treatments may be applied in various ways. The smooth, scraped and textured finishes and the final coat for pebble-dashing may either be laid on or thrown; roughcast must be thrown, and the machine finishes are, as the name implies, applied by hand or mechanically operated spattering boxes or by pneumatic sprays or guns. The thickness of these finishing coats will also vary to some extent, but most types are between ¼ and ⅜ inch thick. Some of the finer-textured machine finishes may, however, be as thin as ⅛ inch. For scraped finishes the final coat is usually applied to a thickness of about ⅜ inch, of which about ⅛ inch is removed in the scraping process; the scraping is usually done some 3 to 6 hours after the finishing coat is applied, but the most suitable time varies with the mix used and the weather. In any continuous face of a wall, finishing treatments of any type should be carried out continuously and day-to-day breaks made to coincide with architectural breaks in order to avoid unsightly junctions.

It is sometimes necessary to spray a finish with water or to protect it from the sun or wind in order to prevent it from drying out too rapidly. Heavy rain or frost during the first two days after application may also cause damage, and since it is generally not possible to give protection against such conditions the simplest solution is to avoid carrying out finishing treatments when heavy rain or frost is forecast.

Rendering on metal lathing. Many of the difficulties in using metal lathing as a base for external rendered finishes are associated with the problem of fixing. The risk of cracking, for example, can be greatly reduced by taking proper care in lapping to avoid weak points and variations in thickness of the rendering at the edges of sheets. Tight stretching of the lathing, particularly with the simple types of expanded metal, is necessary to avoid waviness and the consequent necessity for varying the thickness of the rendering to obtain a true finish.

Ordinary expanded metal should be fixed with the long-way of the mesh across the supports, and should be lapped not less than 1 inch or one mesh (whichever is the greater) at the sides and ends. End laps should be made to occur only over supports and there should be no lapping over corners. The edges should be tightly wired together with galvanized wire at intervals of 3 inches, except over supports. Galvanized nails or staples should be used for fixing to timber, and galvanized wire or rustproof clips for fixing to steelwork. It is advisable to place narrow strips of wood or other suitable material upon the supports behind the expanded metal when fixing, in order to space it about ¼ inch from the face of the supports. This allows the first rendering coat to go behind the metal, gives a better key, and reduces the risk of corrosion.

The first undercoat should normally be of just sufficient thickness to cover the face of the lathing; it should be combed or scratched to give a key for the next coat. Back rendering, wherever it can be applied, should be done when the first undercoat on the face is hard enough to permit. The work should then be allowed to dry as completely as possible before applying further coats. Neglect of this precaution is a frequent cause of cracking of the finish. If the surface is uneven a second straightening undercoat is necessary in order to even it up before applying the finishing treatment, and if a machine-applied or a scraped finish is being given, this second undercoat is necessary to give adequate protection to the steel. END



Behind Mr. Stamm are three 300-foot double-T beds, shown between runs. Not shown are three 300-foot flat beds. Turbotville's plant, now producing building beams, will soon add bridge girders to the line.

"Uniformity of quality plus service are why we choose Leschen Strand"

Allen G. Stamm, President, Turbotville Block Co.

This Pennsylvania producer, serving a 160-mile radius, is one of a growing number who have learned to depend on *Leschen Prestress Strand.* In a field that Mr. Stamm calls "still in its early days", the technical advice of Leschen engineers often provides the key to efficient, informed methods.

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If you would like to talk with a Leschen engineer or receive complete specifications and other helpful information, write today to *Leschen Wire Rope Division, H. K. Porter Company, Inc., St. Louis 12, Mo.*

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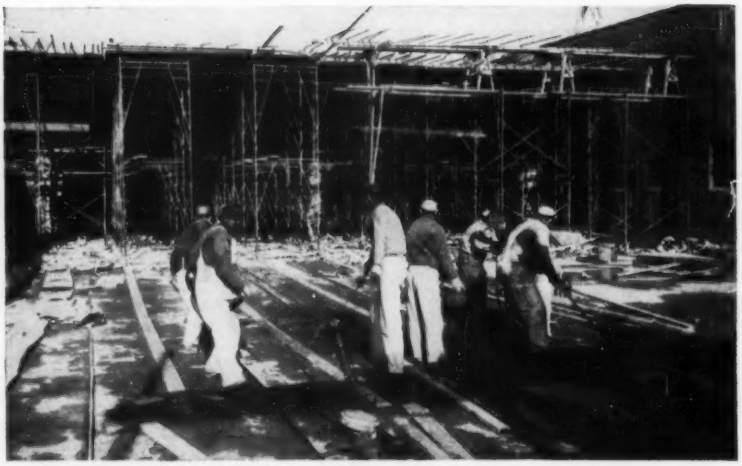
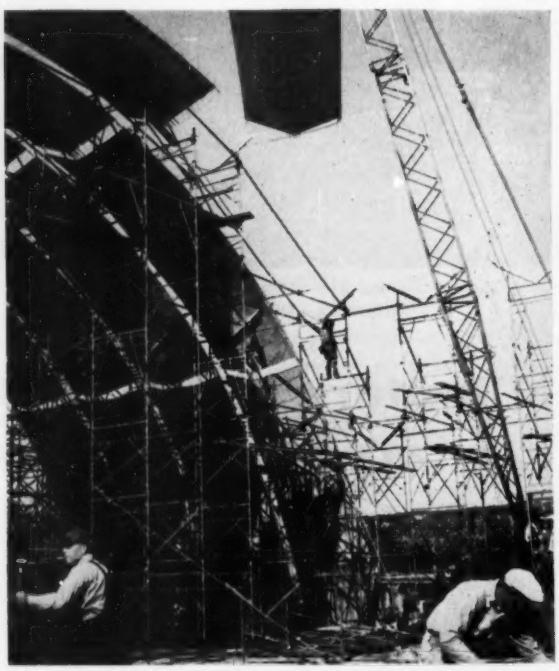
Shoring Methods...

A Picture Report on Efficient Ways to Shore Concrete . . . by Patent Scaffolding Co.



FAST METHOD MOVES SHORING WITH FORMS—Soaped sills, placed under shoring legs, provide fast movement of 960 sq. ft. sections of "Trouble Saver" Shoring with formwork, to succeeding drophead panels on this slab job at Kentile, Inc., So. Plainfield, N.J. Method uses only half the shoring (462 frames) and formwork usually required, and saves the contractor, Fred J. Brotherton, Inc., considerable time, equipment and costs. Each section is moved, as shown, to its new location in just 15 minutes.

EASY-TO-ERECT PIER SHORING—"Trouble Saver"® Steel Shoring, made with 3'-wide ladder frames, provides ample support for beams on several pier capitols on this bridge in Palmyra Township, Pa. Frames, spaced 3' apart, shore capitols 3'6"-wide by 4'-thick. Built-in ladders give workers quick access for forming and stripping. Willis, Paul & Proctor, general contractor. P.S. Co. offers engineering layouts specifically detailed for every job.



CORRUGATED BARREL ROOF SUPPORT—Support for this unusual corrugated, reinforced concrete roof is provided by "Trouble Saver" Shoring towers with 104 special V-shaped cradle frames. These units, designed by P.S. Co., were set on top of the shoring frames to conform to roof segments, which measure 10' 3½" wide and 2'9" deep in cross section. Holy Trinity H. S., Trinidad, Colo. Platt-Rogers Constr. Co., gen. contr.

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FINISHING HARDENED CONCRETE

MORE AND MORE during recent years architects' specifications are calling for finely finished concrete surfaces on walls, columns, ceilings and floors. At first, contractors used hand rubbing bricks, but finding this technique to be slow and costly for large areas, they turned to various sorts of powered tools. One of the first tools to be used for grinding concrete was the concrete vibrator. The vibrator head was removed from the flexible shaft and a geared right angle head was substituted with a disc or grinding wheel attached. This is still used to a great extent.

However, vibrators are heavy and concrete men wanted an electric tool just for finishing hardened concrete. Because of this demand, manufacturers developed special lightweight electric flexible shaft tools and grinding discs that have made the hand rubbing brick obsolete.

There are basically two methods used to smooth off hardened concrete surfaces. They are dry grinding and wet rubbing.

Dry grinding with a flexible-shaft grinding machine to remove fins and form marks from hardened concrete.

Dry Grinding. Dry grinding is done on dry concrete surfaces to remove fins and marks caused by forms. Formerly resinoid abrasive cup grinding wheels were used for this, but recently abrasive discs have been developed that are much lighter than the grinding wheels and do an excellent job. These discs are made up of multiple layers of abrasive-impregnated cotton fiber material bonded together under heat and pressure with strong resin bond. A silicon carbide abrasive is used since this has been found to be the best abrasive for concrete. These discs are usually about ¼ inch thick, and come in diameters of 7 to 9 inches. They can be applied to the work at an angle of 30 to 40 degrees using the weight of the tool for pressure. These discs can be attached to any type of portable tool and should be operated at from 3,000 to 4,000 rpm.

Wet Rubbing. Wet rubbing is accomplished on green concrete by a slow speed grinding wheel or disc, at the same time applying water. The water, plus the rubbing action, brings

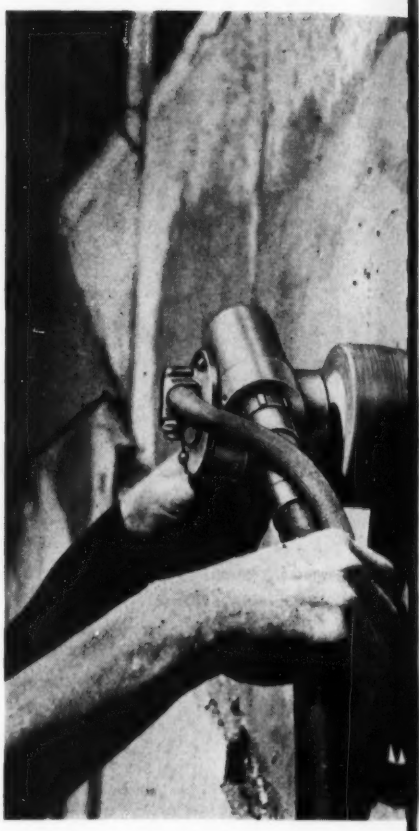
up a cement paste which results in a very smooth, plaster-like surface. The grinding wheel or disc is used with a right angle head, which has various gear reductions to reduce the grinding speed to 300 to 500 rpm. This wet angle head is provided with an attachment for a water hose so that water can run through the center of the grinding wheel onto the concrete. A convenient button on the angle head allows the operator to apply water and grind at the same time. A pressure tank can be used for the water supply.

Where air holes must be filled and a smooth surface obtained on dry concrete (as distinguished from green concrete), a similar technique can be used. First, however, the operator paints on a coating of cement with an ordinary hand brush. Then the wet cement is rubbed in, applying water where necessary.

For wet rubbing, special resinoid bond abrasive cup grinding wheels are available with a silicon carbide abrasive. Usual sizes are 4½ and 6 inches in diameter. A new development that is equally good is the waffle pattern disc with fiber backing through which nylon loops have been sewn to provide a strong adhesion between the silicon carbide abrasive section (⅛ inch thick) and the backing material. The waffle pattern provides a controlled amount of flexibility so that it hugs the work surface and also serves to clear the ground particles off the work and out of the disc. This waffle pattern type disc should be applied at an angle of about 5 degrees to the surface, using only the pressure created by the weight of the tool.

For dry grinding or wet rubbing floors, the same techniques can be applied as already described. However, manufacturers of rotary trowels have bricks available that can be attached in place of the trowel blades. With this arrangement, large floor areas can be ground quickly and made extremely smooth without requiring the operator to bend over. END

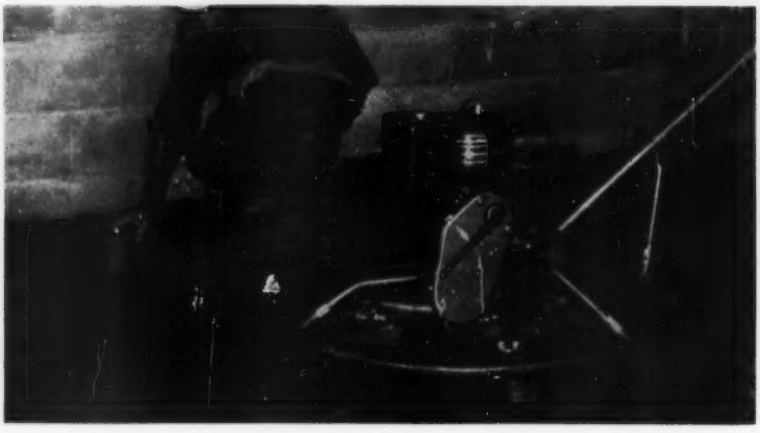
Readers who would like to have additional information on the subject discussed in the foregoing article may request it by filling out one of the reader service cards in this issue.



UPPER RIGHT: Wet grinding the same section of concrete with a 4½-inch grinding wheel. For this operation a cement slurry is first painted on the wall with a brush, and water is also introduced through the grinding head. The latter has a 10:1 speed ratio to reduce the grinding speed to 340 rpm.

LOWER RIGHT: A number of machines now on the market make it possible to grind the under sides of concrete floors without having to build working platforms. The unit pictured here can be readily adjusted for any normal floor-to-floor height.

BELOW: Conventional rotary trowels can be adapted to dry grinding or wet rubbing hardened concrete floors by replacing the trowel blades with grinding bricks.



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With a "Special Winterized" mix containing 2% of SOLVAY Calcium Chloride, heated water and aggregate, you keep close to warm weather schedules at any temperature—get concrete with 8 to 12% greater ultimate strength . . . more workability. This permits lower water-cement ratio, resulting in denser, more moisture- and wear-resistant concrete.

SOLVAY Calcium Chloride speeds but does not change the normal chemical action of portland cement. Impartial tests by the National Bureau of Standards proved its advantages in cold weather concreting. This use of calcium chloride is recommended or approved by leading authorities, including American Concrete Institute and Portland Cement Association.

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Dodson's Digest

A la carte(r)

A garage builder had just opened for business, and I called on him to tell him about Calcium Chloride.

"Name's Dodson," I greeted him as I entered. "Like to talk about . . . "

"Mine's Carter – Bill Carter," he interrupted. "You've come at a bad time. Never again will I start a garage business in the winter!"

"No better time to tell you about Calcium Chloride," I explained, handing him my card. "When you lay your concrete slabs, Calcium Chlor - - - "

"Hold it a minute, Dodson," he broke in. "I'm up to my neck in capital outlays. If you've got something that'll put change in the old purse, okay. If not, see me next summer."

"Well, Mr. Carter," I said, "I've been around long enough to know that anyone just starting up has his hands full! I wouldn't bother you if I didn't think Calcium Chloride could do you some good!"

"Go on then," he consented. "But hurry. Got a lunch date in ten minutes."

"As I started to tell you," I continued, "you'll save by using Calcium Chloride in your concrete mix. Reduces set-time by two-thirds, so your crew leaves the job sooner. You cut down on fuel and canvas. Gives the concrete higher early *and* final strength! Prevents freeze-ups – and there's less chipping and cracking."

"Okay, okay, Dodson," he replied. "I'll consider it."

Just then he opened a drawer and took out a lunch sack. "Hey!" I laughed. "Thought you had a date!"

"I do!" he replied, grinning. "Here, have a sandwich!"

– L. D. Dodson

P.S.—If cold weather is eating away your profits, send for your free copy of our booklet, "How To Make Better Concrete Products and Ready Mix." *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.*

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HEADQUARTERS FOR CALCIUM CHLORIDE

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equipment and tools

For additional free information mail inquiry card on page 12B.

Cleaning Compound

A liquid chemical replaces sand blasting or steam for cleaning masonry surfaces. It is applied by brush and rinsed off with water and is harmless to hands, wood and paint. The manufacturer claims that it effectively removes dirt, oil, and even rust streaks from concrete, quarried stone, asbestos, asphalt, brick, stucco, tile, porcelain enamel, and terra cotta. Write **K & E Chemical Sales Company, 129 Pierrepont Street, Brooklyn 1, N. Y.**

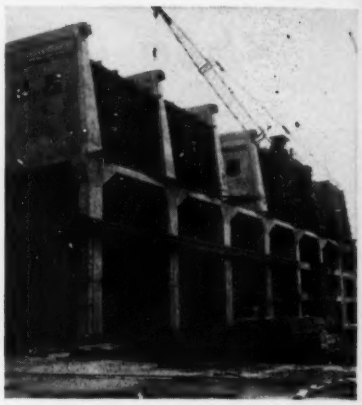
Concrete Vibrators

Two new electric motor-in-head concrete vibrators feature waterproof and concrete-proof switches. The 14-pound model has a head diameter of 1¾ inches and the 24-pound model a head diameter of 2⅝ inches. Both operate at 15,000 VPM, can be handled by one man and are available in 7, 14 and 21-foot lengths with 25 feet of cable. The manufacturer claims that their design virtually eliminates breakdowns and burnouts. Write **Vibro-Plus Products, Inc., P. O. Box 368, Stanhope, N. J.**

Troweling Machine

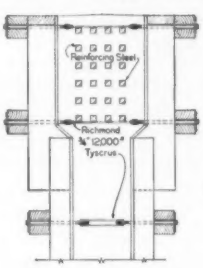
The Senior Lo-Boy troweling machine with 44-inch diameter blade sweep weighs 210 pounds while the Junior Lo-Boy with 33-inch diameter blade sweep weighs 145 pounds. Both models are easily serviced, virtually maintenance free and built to withstand daily use on all types of construction jobs, according to the manufacturer. A control handle close to operator's hand allows easy blade tilting from float to finish. As concrete hardens, the trailing edge of the blade can be tilted down for breakoff or finish. A mercury switch guards against injury to the operator and damage to job and machine. These models are said to have twice the stability with only half the height of previous models. Write **Dart Manufacturing and Sales Company, 1002 South Jason Street, Denver 23, Colo.**

anchor walls



Richmond Tyscrus perform double function in unique hangar construction

The top walls of this air line hangar building at New York International Airport – built by Corbetta Construction Company – act as anchors for the steel cables which will support cantilever roofs over hangars on both sides. Richmond Tyscrus, at 4′ x 2′ spacing, hold the forms in place for a full-height continuous pour of these 12″ x 30′ x 100′ anchor walls. In addition, the Tyscrus support the reinforcing steel cages of 24 1⅝″ square bars, thermit-welded to provide 100 ft. long continuous reinforcing in the top beams of each wall. Weight of this reinforcement runs around 240 lbs. per foot.



TOP SECTION, ANCHOR WALL

An ingenious system of pouring pockets in the forms permitted easy access to the Tys for installing Tylags on the closing side. Assembly and stripping of forms was fast; Richmond 2-strut, ¾″ Tyscrus (published safe load 12,000 lbs., ultimate strength 20,145 lbs.) have self-cleaning threaded connections.

The new Richmond Handbook describes the full line of Richmond-engineered tying devices. Write to: RICHMOND SCREW ANCHOR COMPANY, INC., 816 Liberty Avenue, Brooklyn 8, N. Y. or 315 So. 4th St., St. Joseph, Mo.

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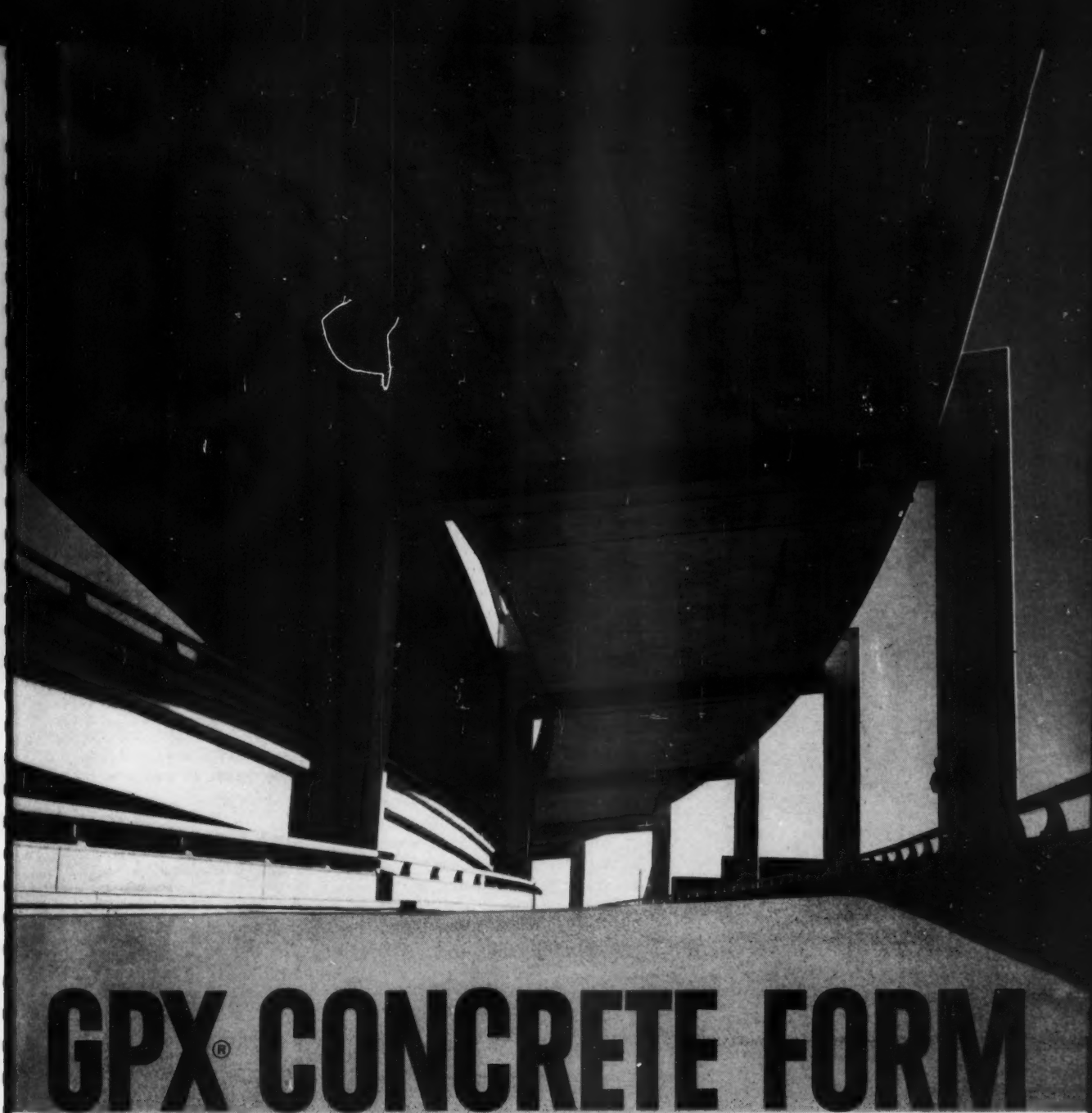

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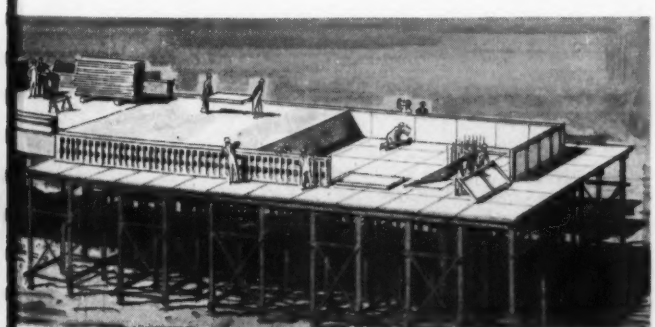

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Whether it's a skyway, or a skyscraper, this high-density plastic-faced plywood is the ideal concrete form.

Smoother surface. You get a handsome concrete face, unmarred by grain, checks or patches. In buildings, ceiling slabs can be quickly prepared for painting.

Faster stripping. Smooth waterproof panels won't cling to concrete, are immediately available for re-use.

Longer form life. Form life is limited only by the number of cuts, and handling care. Available in all standard sizes and can be custom-sized. Write today for sample, specifications, and local source. Address Georgia-Pacific, Dept. CCM 1258, Equitable Bldg., Portland, Oregon.

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equipment and tools

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Concrete Finishing Machine

Automatic steering and centrally grouped controls provide safe and efficient operation of a new concrete finishing machine. A special clamping adjustment system eliminates the use of nuts and bolts when frame-widening is done manually. A hydraulically powered frame-widening system is available for fast width adjustment, a feature which is important on tapered lanes and interchange work. The machine is equipped with automotive-type transmission and a range of speeds for any job. Write **Chain Belt Company, 4701 West Greenfield Avenue, Milwaukee, Wisc.**

Material Hoist

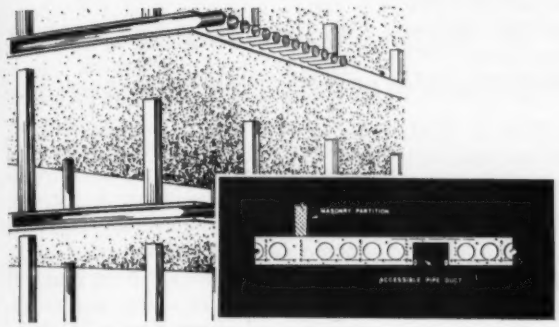
Built of aluminum, the Auto-Vator with E-Z Up trailer offers contractors a fully automatic material hoist which can be moved easily from job to job and set up in a few minutes by one man. The unit hooks on to any car or truck and is unhooked and tilted into working position on job location. Legs lock to form a stable A-frame tower. The Auto-Vator has remote control, adjustable platform stops and side unloading, telescopes up to 40 feet, with extensions available, and is powered by gas or electric motor. Write **Engineered Equipment, Inc., 1001 Linden Street, Waterloo, Iowa.**

Horizontal Shoring Beams

The Pecco-Beam is a horizontal shoring beam used for supporting concrete slab forms for concrete slab construction. It carries uniform distributed weights up to 6,600 pounds. The beams are designed on the telescopic principle and are easily pulled into position and secured by a wedge lock. A hammer is the only tool needed. Weighing only 8 pounds per foot, the beams are easy to move from job to job. They may be rented or purchased. Write **American Pecco Corporation, 188 East Post Road, White Plains, N. Y.**

equipment tools materials

Additional free information concerning any item described in these columns may be obtained by filling out and mailing the postage-free reader service card located between pages 12 and 13 in this issue.

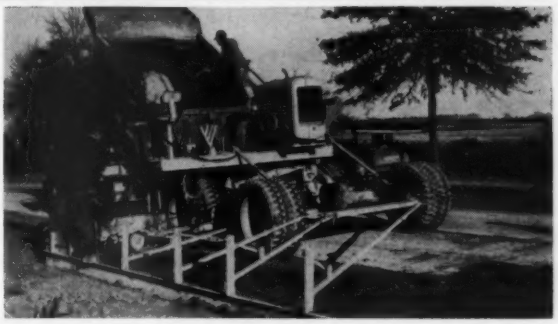


Tube Slab Construction

New and interesting design opportunities are being created with tube slab construction for concrete floors and roof decks. This system uses paper tubes to form the hollows in the slabs, eliminating dead load of material close to the neutral axis and extending span lengths practically without limit. The saving in concrete cost is said to exceed the cost of the paper tubes. The tubes may be used as channels for wiring, piping and duct work. Installation procedure is simple and economical of time. **The Tube Slab Company, Hartford, Connecticut.**

Road Widener

Only seven days were required to complete this 6¼-mile long road widening job in Delaware. The contracting firm used a Blaw-Knox Road Widener with slip form attachment. The slip form eliminated need for conventional steel forms. High speed operation of the widener enabled placing of low slump concrete at a rate of 72 cubic yards an hour. The unit proved effective in pushing a 16-ton load ahead of it. **Blaw-Knox Company, 300 Sixth Avenue, Pittsburgh, Pa.**



literature

For additional free information mail inquiry card on page 12B.

Soil cement stabilization. A 36-page illustrated book deals with every aspect of soil cement stabilization as related to street, highway, super-highway, parking lot and airport construction. What is soil cement? Where is it used? How is it best processed? What are the best operational procedures? These are some of the questions answered and explained by charts and typical job examples. Pettibone Mulliken Corporation, 4700 West Division Street, Chicago 51, Ill.

Modular bibliography. The Modular Building Standards Association has announced publication of a bibliography listing books, articles and technical papers dealing with the modular system of coordinated dimensioning for buildings and products used in their construction. The Association, which was formed last year, serves to promote and support the work of American Standards Association's Sectional Committee A62 for modular coordination. Membership in the group is open to manufacturers, architectural, engineering, contracting and home building firms, and individuals interested in seeing modular coordination become the accepted practice of the building industry. Modular Building Standards Association, 2029 K Street, N.W., Washington 6, D. C.

Tie wire. Cal-Tie Wire is available in either annealed or galvanized, 14 through 20 gauge, and is tightly coiled and packaged 20 coils to a carton for storage in minimum space. It is carried by the workman at the belt line on its reel-type dispenser, eliminating large diameter shoulder coils which are difficult to manage and dangerous. This tie wire is fully described in bulletin HP-318-5M available from Colorado Fuel and Iron Corporation, Continental Oil Building, Denver, Colo.

Prestressed concrete in school building. Folder No. 3, one of a series on specific job uses of post-tensioned prestressed concrete, outlines the use of the Prescon System of prestressing in school buildings. In addition to illustrating construction features of an actual building, the folder shows estimated costs for the 7,700-square foot area of the roof. The Prescon Corporation, P. O. Box 4186, Corpus Christi, Texas.

Watertight masonry. A 6-page folder, O. M.-8A, outlines six important considerations in designing watertight masonry walls. Discussion covers the selection and proportioning of ingredients, types of mortar, compatibility of brick and mortar, importance of shrinkage control, the effect of mortar bleeding, mechanical disturbance, and the role played by Omicron Mortarproofing in aiding both workmanship and watertightness. The Master Builders Company, 7016 Euclid Avenue, Cleveland 3, Ohio.

Soil testing. "Testlab Digest No. 1" describes a light mechanized soil sampler that can be carried and operated by one man. It is said to operate in almost any soil to depths of 15 feet. Other testing equipment is also included in the folder. Testlab Corporation, 2734 North Laramie Avenue, Chicago 39, Ill.

VOLUMES 1, 2 and 3
CONCRETE CONSTRUCTION MAGAZINE

A Listing of Basic Articles by Subject

Published from September 1956 through December 1958

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(CONTINUED NEXT PAGE)